



# Occupational Accidents and Work Injuries in Jordan's Economic Sectors between 2010 and 2019

Salah Aljbour\*

Department of Chemical Engineering, Mutah University, 61710 Karak, Jordan.

## Abstract

A growing emphasis is being placed on raising global awareness of the magnitude and consequences of work-related accidents, injuries, and diseases, as well as designing and implementing efficient preventive and protective policies and programs. Statistical data on occupational accidents and diseases, as well as work-related deaths on a national level, may assist decision makers in critically assessing the status of occupational health and safety (OHS) and proposing appropriate measures to improve the status of OSH to meet global standards. Jordan faces economic challenges that necessitate effective measures to reduce damage and economic losses caused by workplace accidents and injuries, as it has been revealed that the work injury rate is approximately one accident every 44 minutes and the death from a work injury occurs every 3 days. The average fatal injury rate per 10<sup>5</sup> of workers is 8.6. The manufacturing sector reported the largest percentage of work injuries (35.9%). The fall of persons caused the largest percentage of work injuries (29.3%). Accidents that resulted in "Bruises" accounted for 33.4% of all accidents, while accidents that resulted in "Wounds" accounted for 26.8% of all accidents. The percentage of work-related injuries that resulted in curable injuries accounted for 75.8% of the total injuries. The cost of work accidents is reflected by an estimated average of 80000 absence days and annual social security costs of approximately 8.8 million JD.

**Paper type:** Research paper

**Keywords:** occupational accidents, work injury, workforce, fatality, Jordan.

**Citation:** Aljbour "Occupational accidents and work injuries in Jordan's economic sectors between 2010 and 2019", *Jordanian Journal of Engineering and Chemical Industries*, Vol. 5, No.2, pp: 32-45, (2022).

## Introduction

More than 2.78 million individuals die every year as a consequence of occupational accidents or work-related diseases. In addition, 374 million non-fatal work-related injuries occur each year, resulting in more than four days of lost work (Wadsworth and Walters, 2021). According to EUROSTAT data, 3.2% of workers in the EU-27 suffer a workplace injury during one year, amounting to about 6.9 million persons (Venema *et al.*, 2011). Globally, lost workdays are projected to account for around 4% of global Gross Domestic Product, with some countries accounting for as much as 6% or more (Takala *et al.*, 2014; Fan *et al.*, 2020). The majority of workplace accidents and injuries are related to workers' unsafe conduct, which is also a reflection of system deficiencies and a hazardous work environment (Dodoo, and Al-Samarraie, 2019). There are numerous types of hazards in the workplace, including chemical, ergonomic, physical, and psychosocial hazards. Obtaining resources on specific hazards and their control, such as identification, risk assessment, and inspections, may aid in maintaining a healthy and safe workplace. Because it influences prospects for economic and social development, a safe and healthy working environment is critical for overall sustainability (Kavouras *et al.*, 2022).

\*Corresponding author: E-mail: [saljbou@mutah.edu.jo](mailto:saljbou@mutah.edu.jo)

ORCID: <https://orcid.org/0000-0001-9084-3471>.

Received on February 15, 2022.

Accepted on May 29, 2022.

*Jordanian Journal of Engineering and Chemical Industries (JJEI)*, Vol.5, No.2, 2022, pp. 32-45.

Revised: on May 28, 2022.



© The author

Occupational accidents in the workplace have a substantial influence on corporate management performance through victim compensation payments and production halts. In addition, occupational accidents in a corporate may cause a bad reputation for the corporate (Anderson *et al.*, 2019; Kim and Park, 2021). Accidents can lead to a loss of trust among employees and workers. Corporations with a high record of occupational accidents may be subjected to restrictions on tendering by government authorities (Asanka and Ranasinghe, 2015). Data on occupational accidents can be obtained from the national statistics department (NSD), social security corporation (SSC), and labor organizations and institutions (LOI). It is critical to statistically analyze occupational accidents. Such analysis aids managers and decision-makers in comprehending the significance of applying preventative and control approaches throughout firms and organizations.

The Jordanian Labor Law defines a work injury as an injury caused to a worker from and in connection with work. It also includes injuries that occur while travelling or from work (Labor Law, 1996). The Jordanian Social Security Law defines a work injury as an injury to a worker with one of the occupational diseases or the injury arising from an accident that occurred to the insured while performing the work or in connection to work. This includes every accident that occurred to the insured while travelling to work or returning from the work, provided that it is in the usual way, or that the undertaken route is an acceptable route to go to work or return from it (Social Security Law, 2014). According to the Jordanian Social Security Law, establishments must report any work accident that occurs to any of their employees. The report must be sent to the SSC within 14 working days from the date of the accident. The report must be co-submitted with an initial medical report describing the condition of the injured insured worker. In case of establishments violate this obligation, it bears 15 % of the medical care expenses for the injured worker. In addition, the uncommitted establishments must bear the daily allowance due to the injured worker following the law. The law preserved the right of the injured worker to inform SSC concerning the work injury within four months of its occurrence (Social Security Law, 2014). This study addresses the role of the official authorities in Jordan responsible for occupational safety and health issues in terms of their duties and administrative departments. The primary purpose of this study is to evaluate the accidents that were officially reported in work settings and working conditions relevant to the workforce from 2000 to 2019 in Jordan.

## 1 Methodology

The research is based on a qualitative analysis of statistical data related to work injuries and accidents in Jordan from 2000 to 2019. The data series included in the statistics were gathered from the annual reports published by the Jordanian Department of Statistics (JDS), the Ministry of Labor (MOL), and the Social Security Corporation (SSC). The statistical data comprised non-fatal and fatal workplace accidents in Jordan and the insured workers and the workforce in Jordan. The study focused on variables such as economic activity, the causes of the accident, the type of injury, and the result of injury.

The following indicators were employed in the study (Ural and Demirkol, 2008):

$$\text{Fatality rate} = \frac{\text{Number of fatal death}}{\text{total number of workers}} 10^5 \quad (1)$$

$$\text{Incidence rate} = \frac{\text{Number of injuries}}{\text{total number of workers}} 10^5 \quad (2)$$

## 2 Results and Discussion

### 2.1 Status of Jordanian workforce

**Table 1** shows the profile of the workforce in Jordan between 2000 and 2019.

**Table 1** Profile of Jordanian workforce (Ministry of Labor, 2019a-2000).

Year	Potential Jordanian Workforce	Total Jordanian Workers	Jordanian Workers (Male)	Jordanian Workers (Female)	Jordanian Working (%) Female)	Registered non-Jordanian workers	Workers in Qualifying Industrial Zones
2000	NA	NA	NA	NA	NA	110580	NA
2001	1136900	NA	NA	NA	NA	136573	18943
2002	NA	515900	437300	78600	15.2	127181	NA
2003	NA	675300	507600	167700	24.8	148351	NA
2004	1250275	804100	603000	201100	25.0	288756	NA

<b>2005</b>	1273300	1073300	931764	141536	13.2	260357	NA
<b>2006</b>	1308047	1138001	967301	170700	15.0	289724	54062
<b>2007</b>	1312649	1140446	961059	179387	15.7	313962	50048
<b>2008</b>	1342815	1172701	991990	180711	15.4	303325	43072
<b>2009</b>	1400805	1220521	1024529	195992	16.1	335707	33082
<b>2010</b>	1412134	1235948	1033015	202933	16.4	298,342	35941
<b>2011</b>	1436020	1250971	1041263	209708	16.8	280263	36643
<b>2012</b>	1443563	1268093	1056003	212090	16.7	279798	39279
<b>2013</b>	1444699	1262636	1065317	197319	15.6	286197	46786
<b>2014</b>	1460817	1286688	1088865	197823	15.4	324410	51812
<b>2015</b>	1607599	1398030	1173730	224300	16.0	315045	47155
<b>2016</b>	1660256	1406640	1177245	229395	16.3	318883	57728
<b>2017</b>	1817820	1484473	1210020	274453	18.5	340995	70050
<b>2018</b>	1734248	1411265	1145882	265383	18.8	352350	68992
<b>2019</b>	1702187	1377905	1128204	249701	18.1	348736	77015

**Table 2** Percentage of employed workforce based on the economic activities.

<b>Current economic activity</b>	<b>(%)</b>	<b>Female</b>	<b>Male</b>
Agriculture, Forestry & Fishing	1.7	0.7	2.0
Mining & Quarrying	0.6	0.0	0.8
Manufacturing	9.5	6.2	10.2
Electricity, Gas, Steam & Air Conditioning supply	0.9	0.3	1.1
Water supply, sewerage, waste management	0.4	0.1	0.5
Construction	4.9	0.6	5.9
Wholesale & Retail Trade, Repair of Motor Vehicles & Motorcycles	14.9	6.7	16.7
Transportation & Storage	6.8	1.1	8.1
Accommodation & food service activities	3.2	0.7	3.7
Information & Communication	1.5	1.9	1.4
Financial & Insurance activities	1.8	3.0	1.5
Real Estate activities	0.3	0.1	0.4
Professional, scientific & technical activities	3.0	3.1	2.9
Administrative & support service activities	1.5	1.3	1.6
Public Administration & Defense, compulsory social security	27.1	14.3	30.0
Education	12.9	40.9	6.7
Human Health & Social Work activities	5.4	15.2	3.2
Arts, entertainment & recreation	0.4	0.4	0.3
Other service activities	2.4	1.9	2.5
Activities of households as employers, undifferentiated goods and services producing activities of households for own use	0.1	0.4	0.1
Activities of Extraterritorial Organizations and Bodies	0.6	1.2	0.4
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

The labor market in Jordan has witnessed several political, economic, social and demographic challenges, which caused substantial changes in its current plans and policies. The government in cooperation with the private sector are striving to accommodate the growing annual influx of the workforce and to cope with the diversity of the labor market needs of modern specializations. In 2019, the reported number of potential workforce in Jordan was 1702187, among them about 19% are unemployed. About 51% of the employed workforce in Jordan is below secondary education level, and 31.2% of the employed workforce is university graduates. The percentages of the employed workforce within the age groups of 20-29, 30-39 and 40-49 are 29.9, 30.4 and 24.4% respectively (Ministry of Labor, 2019). About 37.8% of the employed workforce is working in the capital Amman. About 20.5 and 12.2% of the employed workforce are working in the other main cities Irbid and Zarqa respectively. On the other hand, Tafila and Madaba ranked last in the percentage of the employed workforce (Ministry of Labor, 2019).

The Jordanian employed workforce is distributed among several economic activities. **Table 2** shows the percentage distribution of the employed workforce based on economic activities.

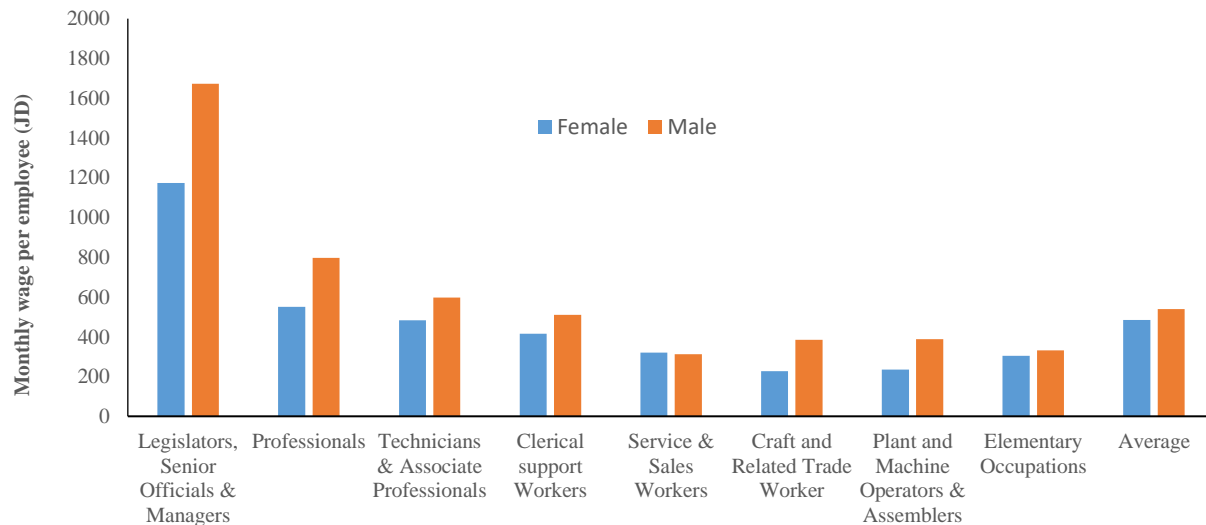
About 27.1% of the employed workforce is working within the public administration and defence, and compulsory social security. About 14.9% of the employed workforce is working within the wholesale and retail trade and the repair of motor vehicles and motorcycles. The workforce survey indicates that the percentage distribution of the workforce among the economic activities differs substantially based on the sex of the workforce. For example, about 40.9% of the female workforce is working within the education sector. **Figure 1** shows the percentage of the employed workforce based on occupation.



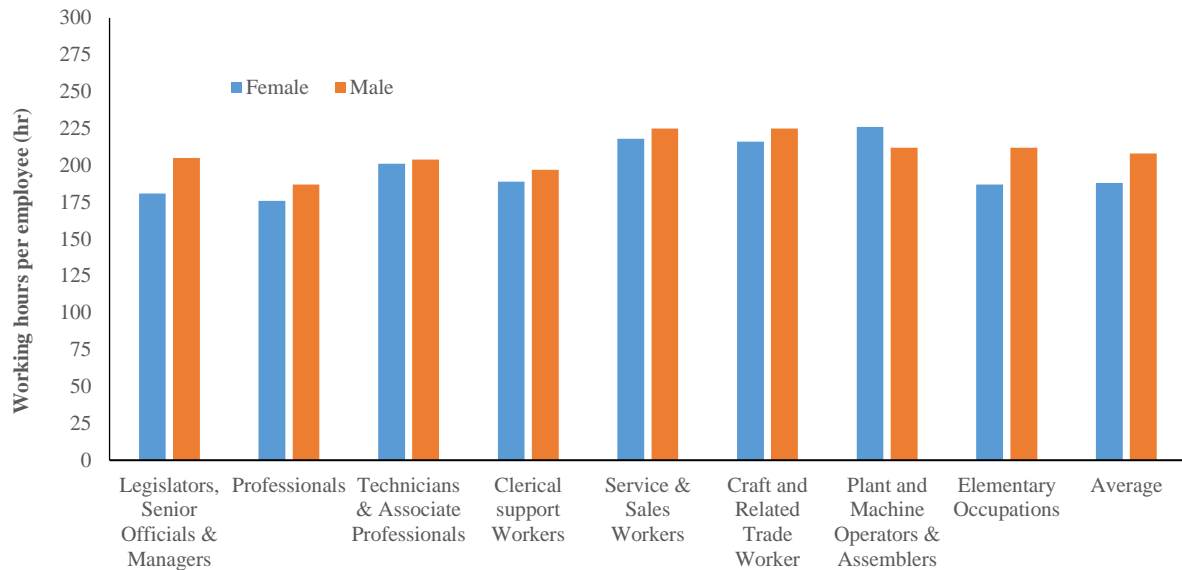
**Fig. 1** Percentage of the employed workforce based on occupation (Department of Statistics, 2019).

About 32.0 and 26.8 % of the employed workforce are working as services and sales workers and professionals respectively.

**Figure 2** shows the monthly wage per employee in the public and private sectors establishments during the reference month "October" in 2018. **Figure 3** shows the working hours per employee in the public and private sectors establishments during the reference month "October" in 2018.



**Fig. 2** The monthly wage per employee in the public and private sectors establishments during the reference month "October" in 2018.



**Fig. 3** The working hours per employee in the public and private sectors establishments during the reference month “October” in 2018.

Legislators, senior officials and managers are reported to receive the highest monthly wages. On the other hand, service and sales workers (male) and craft and related trade workers (female) are reported to receive the lowest average monthly wages. The average monthly working hours are 188 and 208 hours for female and male workers respectively.

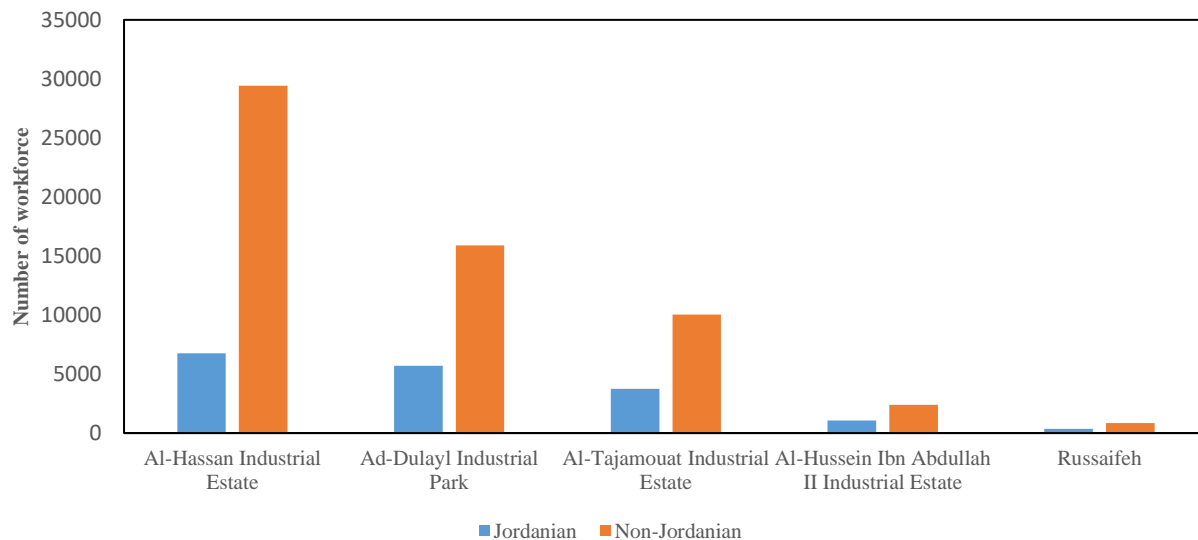
### 3.2 The Jordanian labor market

The Jordanian labor market is characterized by an increased flow of non-Jordanian labor to the labor market. Latest statistics from the Ministry of Labor indicated that the percentage of the registered foreign workforce to the total workforce in the Jordanian labor market is approximately 20.5% (Ministry of Labor, 2019).

Jordan has established several development zones, free zones and industrial qualifying zones, which aim to host the establishment of different economic activities and house manufacturing operations. There are 16 development zones distributed throughout the kingdom, either in existence or under construction (Ministry of Investment, 2022). The number of workers in the industrial qualifying zones reached 77015 in 2019 of whom 58683 workers are not Jordanians. **Figure 4** shows the number of workforce in the major development zones in 2019.

### 3.3 Ministry of labor and its role in OHS

Monitoring and inspecting workplaces to ensure the availability of a healthy and safe work environment is one of the main tasks carried out by the Ministry of Labor. Several clauses mentioned in the ninth and tenth chapters of the Jordanian Labor Law pay great attention to the health and safety of workers in all sectors and work sites. The Ministry of Labor constantly seeks to develop and amend regulations and laws to face the increasing risks faced by workers with the acceleration of the industrial renaissance in the country. The Directorate of Occupational Safety and Health is in charge of all activities needed to ensure a healthy and safe work environment. In addition, it preserves and safeguards labor rights through inspection and follow-up of the implementation of labor law legislation concerning occupational safety and health. Three departments are affiliated with the Directorate of Occupational Safety and Health: Occupational Safety and Health Inspection Department, Occupational Accidents and Injuries Department and Occupational Safety and Health Accreditations Department. The Occupational Safety and Health Inspection Department is in charge of the inspection of workplaces to identify possible hazards that might cause work accidents and injuries.



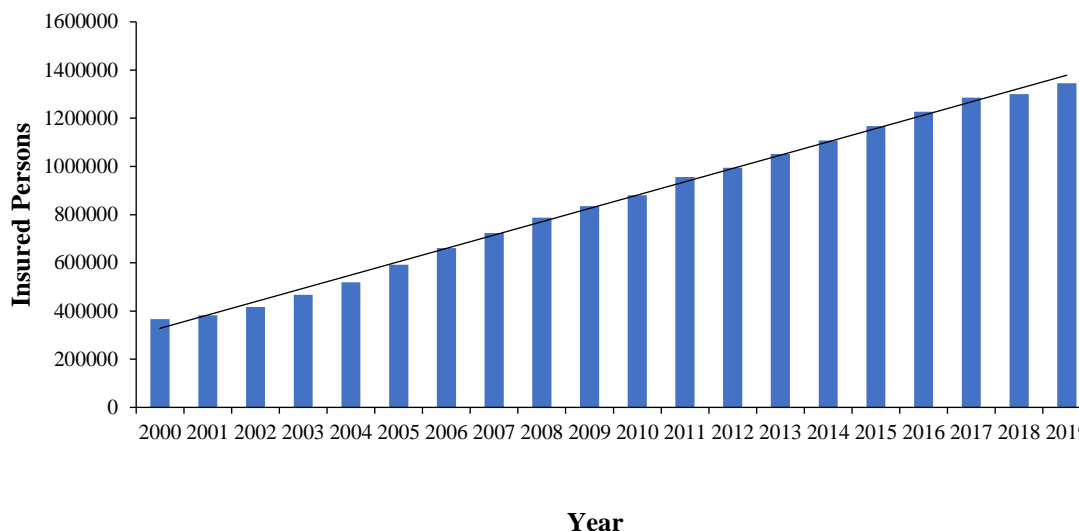
**Fig. 4** Number of the workforce in the major development zones in 2019 (Ministry of Labor, 2019b).

The department provides consultations in the field of occupational safety and health. Resolving labor complaints related to occupational safety and health requirements. The department also measures the level of several types of pollutants at workplaces. The Occupational Accidents and Injuries Department investigate workplace accidents and work injuries. The department calculates compensation in situations of job injuries for workers who are not covered by the Jordanian Labor Law's social security provisions. The department carries out awareness, guidance and inspection activities and campaigns related to occupational safety and health. In addition, it is in charge of resolving labor complaints and disputes related to work accidents and injuries. The Occupational Safety and Health Accreditations Department issues accreditations for occupational safety and health cadres and safety committees for institutions according to the requirements of the Jordanian Labor Law. In addition, the department reviews the occupational safety and health legislations in consultation with the concerned authorities.

### 3.4 Social Security Corporation and its role in OHS

SSC carries out its obligations towards the establishments covered by the provisions of the Social Security Law and the insured persons working in these establishments in the event of a work injury. SSC introduced amendments to social security concerning work injuries-related insurances to be following the terms and standards of occupational safety. A dedicated administration is established as part of the organizational structure of SSC to handle all the affairs of occupational safety and health. The administration is qualified by specialists, to follow up on the implementation of occupational safety and health standards.

The work injury insurance implemented by the SSC covers the costs of medical treatment and the necessary rehabilitation equipment and services. The benefits of this insurance also include daily allowances during the period of unemployment and sick leave due to injury, which is 75% of the wage of the worker insured by the insurance on the date of the injury, as well as the monthly salaries and compensation due according to the percentage of disability arising from the injury. Establishments with work injuries resulting from a lack of proper conditions and measures of occupational safety and health bear all costs of medical care for the injured worker. SSC is authorized to increase the percentage of occupational injury insurance contributions from 2 to 4 percent of workers' wages, depending on the extent to which the establishments are committed to providing and applying the conditions and standards of occupational safety and health. In 2015, the cost of work injuries for workers under the umbrella of the SSC amounted to about 4.1 million Jordanian dinars (1 USD~0.71 JD) (Department of Statistics, 2016). The status of OSH within establishments is subjected to assessment by SSC based on several criteria, such as establishments' commitment to setting safety policies, programs and plans, occupational hazards identification and prevention measures, ergonomics, workers' participation in OSH-related aspects, continuous training, periodic medical examinations, safety performance evaluation within the establishment, and the number of fatal and no-fatal work accidents. **Figure 5** depicts the number of insured workforce in Jordan between 2000 and 2019.



**Fig. 5** Number of insured persons in Jordan between 2000 and 2019.

The Social Security Law distinguishes workers in occupations that have been officially approved as hazardous occupations by allowing early retirement for workers in these professions at the age of forty-five. Workers in hazardous occupations, accordingly, have a shorter working period compared to workers in other occupations. Hazardous occupations are the occupations that cause harm to the health or life of the insured persons as a result of exposure to hazardous factors or conditions in the work environment despite the application of occupational safety and health conditions and standards. SSG began applying the provisions relating to insured persons working in occupations approved as hazardous occupations as of 2015 according to the bylaw of insurance benefits under the Social Security Law No. 1 of 2014. This bylaw included provisions for workers in hazardous occupations and a table of these occupations. Some amendments have been made to this table under the amended bylaw of the insurance benefits system for the year 2016 (Social Security Corporation, 2021). According to the Social Security Law, the insured persons are eligible to apply for an early retirement pension after completing the age of 45 years, provided that he/she has a contribution period of no less than 180 subscriptions for females and 216 subscriptions for males. In addition, the establishment in which he/she works has paid 1% of his/her wages over the old-age, disability and death insurance contributions for his/her work in a hazardous occupation for no less than sixty months during the ten years preceding his/her request to allocate this salary. Establishments are obligated to provide the SSC with the names, wages and professions of the insured working in the dangerous occupations, and to pay the extra contribution for the insurance throughout their work in these occupations (Social Security Corporation, 2021). SSC estimated the number of insured persons who were included in hazardous professions at 144038 representing 11% of the total insured persons in all occupations. The number of establishments in which the insured was included within the hazardous occupations is 7475 which constitutes 8 % of the total establishments. Among the hazardous occupations, the number of insured persons working in waste collection reached 13974 repressing the highest percentage (11.7 %). The number of insured persons working as porters reached 8370 (7%). The number of insured persons working as truck drivers reached 6926 and the number of insured persons working as mechanics reached 6871 (5.8%). The percentage of female who is insured and covered by insurance for dangerous professions in the health sector reached about 72.4%. About 36.3 % of insured persons who are working in hazardous occupations are affiliated with the public administration, defence and social security sector, while, 21.1 % are affiliated with the manufacturing sector. The wholesale and retail trade sector contributed to about 9 % of insured persons who are working in hazardous occupations. The age group of (25-34) years contributed the highest percentage of insured persons who are working in hazardous occupations (34.3 %), followed by the age group (35-44) years (32.5%) (Jordan News Agency (Petra), 2021).

### 3.5 Profile of work accidents in Jordan

**Table 3** shows the profile of fatal and nonfatal injuries in Jordan between the years 2000 and 2019. The results indicate a steady increase in the number of fatal injuries. The number of fatal injuries doubled in 2019 compared to 2000. The last two decades witnessed a steady increase in the workforce in Jordan as a result of economic and demographic factors.

**Table 3** Fatal and nonfatal injuries in Jordan during the years 2000 and 2019 (Minsirty of Labor, 2019, Department of Statistics, 2019, Social Security Corporation, 2019).

Year	Workforce (Jordanian +NonJordanian)	Insured Persons	Fatal Injuries	Fatal and Non Fatal injuries	Accidents and work injuries	Fatality rate	Incidence rate	Accidents rate per 100000 workers	Accidents rate per 1000 insured
2000	NA	366330	75	12308	16899	-	-	-	-
2001	NA	381896	71	12893	17474	-	-	-	-
2002	643081	416374	72	12198	16761	11.2	1885.6	2606.4	40.3
2003	823651	467044	96	11918	16354	11.7	1435.3	1985.5	35.0
2004	1092856	519372	92	13057	17642	8.4	1186.3	1614.3	34.0
2005	1333657	592230	91	12977	17296	6.8	966.2	1296.9	29.2
2006	1427725	661651	106	12743	17360	7.4	885.1	1215.9	26.2
2007	1454408	724167	127	13265	18300	8.7	903.3	1258.2	25.3
2008	1476026	787817	82	13224	17243	5.6	890.4	1168.2	21.9
2009	1556228	835000	94	13442	17261	6.0	857.7	1109.2	20.7
2010	1534290	881000	93	13274	17224	6.1	859.1	1122.6	19.6
2011	1531234	955566	74	12316	16768	4.8	799.5	1095.1	17.5
2012	1547891	994711	80	11997	16589	5.2	769.9	1071.7	16.7
2013	1548833	1051798	280	10756	15822	18.1	676.4	1021.5	15.0
2014	1611098	1107895	178	12449	15405	11.0	761.7	956.2	13.9
2015	1713075	1166991	135	9208	14616	7.9	529.6	853.2	12.5
2016	1725523	1227110	179	10436	13505	10.4	594.4	782.7	11.0
2017	1825468	1285168	153	9576	13049	8.4	516.2	714.8	10.2
2018	1763615	1300445	147	9860	12508	8.3	550.7	709.2	9.6
2019	1726641	1345118	143	10072	12551	8.3	575.0	726.9	9.3
Average						<b>8.6</b>	<b>869.0</b>	<b>1183.8</b>	<b>20.4</b>

The annual reported work-related injuries range from 10072 to 13442 work injuries. The work injury rate is approximately one accident every 44 minutes and the death from a work injury occurs every 3 days. The average fatal injury rate per 100000 workers is 8.6 which is lower than that reported for the region of Africa (17.39) and Asia (12.99). However, the average fatal injury rate per 100000 workers in Jordan is higher than those reported for America (5.12), Europe (3.02) and Oceania (5.51). In 2014, the EU-28 average fatal injury rate per 100000 workers was 1.83, while Turkey had a rate of 12.2 (İŞSEVER et al, 2020). In 2014, Portugal had a fatal occupational accident incidence rate of 3.56 per 100000 workers that were almost double the EU (Santos et al., 2018). Globally, the reported fatality rate per 100000 workers is 11.29 (Hämäläinen et al., 2017).

Considering the manufacturing sector, for example, the average fatal injury rate per 100000 workers is 2.08 for US and 0.97 for the UK. However, for the construction sector, the average fatal injury rate per 100000 workers is 9.03 for US and 3.17 for the UK (Mendeloff and Staetsky, 2014). The incident rate ranged from 516.2 to 1885.6, with an average value of 869 for the years 2002-2019. In 2013, Jordan, registered an incident rate of 676.4, whereas, the EU-28 registered an incidence rate of 1533.39. In Bulgaria and Romania, the incidence rate was fewer than 100 accidents per 100000 workers, whereas Spain, Portugal, and France had more than 2750 accidents per 100000 workers in 2013. The highest rate was observed in France, with an incident rate of 3160 (Ivascu and Cioca, 2019). In 2014, Portugal had an incidence rate of 2892.6 per 100000 workers (Santos et al., 2018).

The accident rate per 1000 insured ranged from 9.3 to 40.3, with an average value of 20.4 for the years 2002-2019. For comparison, the accident rate per 1000 insured in 2017 was 10.8 in Jordan, while it was 24.84 in Turkey in the same year (İŞSEVER et al, 2020). **Table 7** shows the cost of injuries and the total number of absence days as reported by the SSC in Jordan from 2010 to 2019.

**Figures 6** and **7** show the cost of injuries and the total number of absence days as reported by the SSC in Jordan from 2010 to 2019 respectively.

The results indicate that the cost of injuries in 2019 is approximately 9 million JD, increasing significantly compared to 2010. The reported number of absence days reflects the negative impact of occupational accidents on firm performance in terms of process halts and economic loss. **Table 4** shows the percentages of work injuries reported in insured establishments based on economic activity.



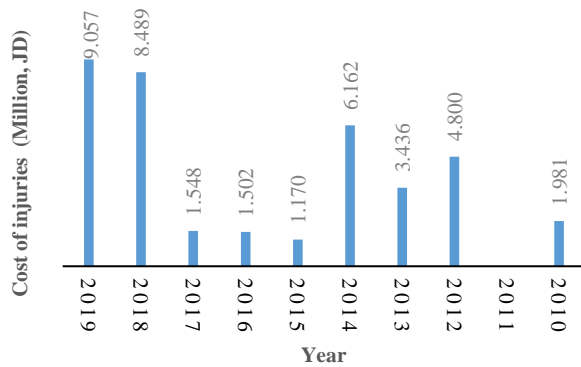


Fig. 6 Cost of injuries in Jordan (Department of Statistics, 2019).

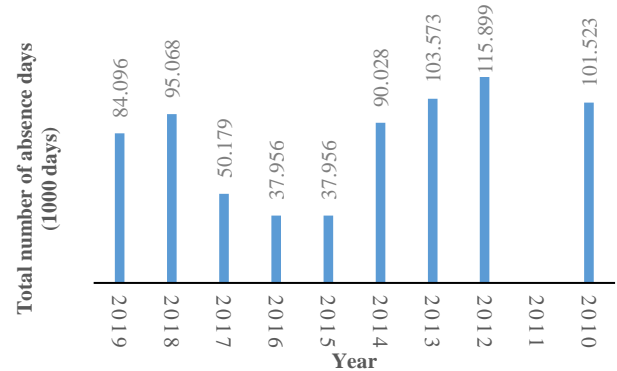


Fig. 7 The total number of absence days in Jordan (Department of Statistics, 2019).

Table 4 Percentage of work injuries reported in insured establishments based on economic activity (Social Security Corporation, 2019).

Economic activity	Year										Average
	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	
Agriculture, Forestry & Fishing	1.4	0.99	0.8	0.7	0.7	0.7	1.1	1.3	NA	1.3	1.0
Mining & Quarrying	1	1.45	1.2	1.5	1.3	1.4	1.9	1.7	NA	1.8	1.5
Manufacturing	32.3	33.04	33.9	32.2	33.4	38.2	38.3	40.7	NA	41	35.9
Electricity, Gas, and Water supply	1.7	1.91	1.8	1.7	1.5	1.5	2.3	2.5	NA	3.6	2.1
Construction	5.5	7.8	8.8	13.1	15.6	13	10.4	9.2	NA	11.7	10.6
Wholesale & Retail Trade	17.1	16.81	17.7	17	16	14	13.2	14.2	NA	11.9	15.3
Hotels and Restaurants	9.7	10.87	11	10.5	10.6	11.9	10.7	9.8	NA	9.4	10.5
Transportation, Storage and Communication	4.4	4.37	4.5	3.6	3.4	3.4	3	2.6	NA	3.2	3.6
Financial & Insurance activities	0.9	1.26	0.9	0.8	0.7	0.6	0.9	1.3	NA	0.8	0.9
Real Estate activities	5.2	3.74	3.9	3.8	3.3	3.4	3	1.9	NA	1.5	3.3
Public Administration & Defense, compulsory social security	8.9	7.19	5.5	5.9	5	4.7	6.6	5.7	NA	5.7	6.1
Education	4.8	4.09	3.8	3.2	2.7	3.1	2.8	2.8	NA	2.9	3.4
Human Health & Social Work activities	5.9	5.09	5	4.7	4.3	3.5	5.1	4.9	NA	4.3	4.8
Community Service Activities	0.9	1.16	1.2	1.1	1.3	0.5	0.7	1.3	NA	0.7	1.0
Activities of non-Regional Organizations and Bodies	0.2	0.23	0.2	0.2	0.1	0.1	0.1	0.1	NA	0.2	0.2
Private families that hire people for household chores	2		0.01	0	0	0	0	0	NA	0	

The manufacturing sector reported the largest percentage of work injuries (35.9%), followed by the wholesale and retail trade sector (15.3%), and then followed by both the construction sector (10.6%) and the hotels and restaurants sector (10.5%). Economic activities such as financial and insurance activities, community service activities and activities of non-regional organizations and bodies have reported lower percentages of work injuries in Jordan. Table 5 shows the percentages of work accidents reported in insured establishments in Jordan based on the cause of injury.

**Table 5** Percentages of work accidents reported in insured establishments based on the cause of injury (Social Security Corporation, 2019).

Cause of injury	Year										Average
	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	
Machines and equipment	7.3	8.5	7.2	6.5	8.5	6.3	6.6	8.3	11.1	12.1	8.2
Work tools	14.9	12.2	11.8	11.5	13.3	14.3	12.3	13.2	10.0	NA	12.6
Walking on objects or collision	7.4	7.8	8.8	10.0	10.8	9.5	11.8	8.0	7.0	5.2	8.6
Falling persons	32.9	33.1	33.9	33.1	36.0	32.6	31.6	28.5	28.4	2.8	29.3
Falling objects	12.3	13.1	14.0	14.1	15.4	14.6	14.9	12.6	12.8	44.0	16.8
Chemical products	1.5	1.2	1.2	1.1	1.2	1.6	1.7	1.5	1.2	27.6	4.0
Loading and unloading goods	0.7	0.6	1.0	0.8	1.1	0.7	0.8	1.0	0.5	7.5	1.5
Explosions and fire breaks	0.7	1.0	0.7	0.7	1.1	1.1	0.9	1.2	0.8	-	0.9
Electricity	0.7	0.7	0.8	0.7	1.0	0.8	0.8	0.7	0.6	-	0.8
Road accidents	9.4	9.7	8.5	9.1	-	7.9	8.4	7.6	7.1	-	8.4
Stuck inside or between objects	1.5	1.8	2.4	2.5		2.9	2.5	-	-	-	2.3
Exposure to dusts	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-	-	-	0.0
Exposure to radioactive materials	0.1	0.0	0.0	0.0	0.1	0.0	0.0	-	-	-	0.0
Hyper stress and violent moves	1.9	2.5	3.3	2.9	2.9	2.5	2.7	-	-	-	2.7
Animals and animal products	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-	-	-	0.2
Ergonomics	2.8	2.1	0.7	1.5	2.1	0.9	0.8	-	-	-	1.6
Criminal accidents	0.3	0.3	0.4	0.5	0.5	0.1	0.4	-	-	-	0.3
Touching hot or cold materials	0.7	1.0	1.2	0.8	1.0	1.1	1.1	-	-	-	1.0
Exposure to noise and vibration	0.0	-	-	-	-	-	-	-	-	-	0.0
Others	4.6	4.2	3.9	4.0	2.1	2.7	2.4	16.1	20.5	-	6.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

The fall of persons caused the largest percentage of work injuries (29.3%), followed by the fall of objects (16.8%), and then followed by work tools (12.6%). Other causes contributed evenly to work injuries such as machine and equipment (8.2%), walking on objects or collisions (8.6%) and road accidents (8.4%). The falling of objects was the main reason behind the occurrence of 44.0% of accidents in 2010. In addition, the percentage of accidents as a result of chemical products reached about 27.6%. The construction and petrochemical industries are responsible for the majority of fall-related injuries in the Middle East (Elghazally and Ewis, 2021). **Table 6** shows the percentage of work injuries reported in insured establishments in Jordan based on the type of injury. The percentage of work-related injuries that resulted in curable injuries accounted for 75.8% of the total injuries, and cases of disablement (less than 30%) accounted for 10.8 % of the total injuries. About 67.6% of the injured persons received first aid for more than three days. The percentage of work-related injuries that resulted in death accounted for 1.1% of the total injuries. The percentage of accidents that led to “Bruises” accounted for about 33.4%, while the accidents that led to “Wounds” amounted to 26.8% of the total accidents. **Table 7** shows the percentage of work injuries reported in insured establishments in Jordan based on the result of injury.

### 3.6 Hazard prevention and control

Effective controls protect workers from workplace hazards, aid in the prevention of injuries, illnesses, and incidents, reduce or eliminate safety and health risks, and assist employers in providing workers with safe and healthy working conditions. According to OSHA and NIOSH, a control hierarchy can be used to determine how to implement feasible and effective control solutions (OSHA, 2016). Figure 8 depicts one representation of this hierarchy:

**Table 6** Percentage of work injuries reported in insured establishments based on the type of injury (Social Security Corporation, 2019).

Type of injury	Year										Average
	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	
Electrical injury	0.5	0.41	0.5	0.5	0.6	0.5	0.4	0.5	NA	0.5	0.5
Strange objects in the eyes	1.7	1.78	1.8	2.1	2.5	3.2	3.2	3.3	NA	3.7	2.6
Traumas	1.1	0.85	0.7	0.8	0.9	0.7	0.5	0.8	NA	0.6	0.8
Amputation and excision	1.6	1.59	1.3	1.4	1.2	1.5	1.5	1.5	NA	1.4	1.4
Poisoning and infection	1.1	0.43	0.8	0.6	0.5	0.3	0.5	0.5	NA	0.6	0.6
Wounds	25	26.12	28.5	27.2	28.2	26.9	28.5	24.5	NA	26.5	26.8
Dislocation and sprain	10.4	11.43	10.6	11.3	8.6	10.4	9.7	9.3	NA	7.8	9.9
Illness	3.5	1.55	0.5	0.4	0.6	0.2	0.2	1	NA	0.6	1.0
Burns	3.4	3.62	3.7	3.4	3.3	3.9	3.9	3.7	NA	3.5	3.6
Bruises	31.9	29.97	31.5	31.2	35.3	35.6	36.5	35.9	NA	32.9	33.4
Fractures	15.4	16.21	14.5	13.6	12	12.7	12.1	13.1	NA	11.1	13.4
Other defined injuries	4.4	6.04	5.7	7.4	6.3	4.2	2.8	5.5	NA	10.7	5.9
Others	0	0	0	0.1	0	0	0.2	0.4	NA	0.1	

**Table 7** Percentages of work injuries reported in insured establishments based on the result of injury (Social Security Corporation, 2019).

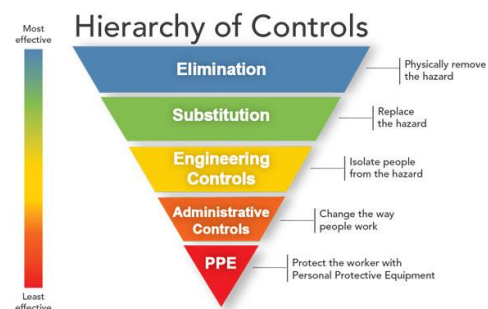
Result of Injury	Year										Average
	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	
First aid less than three days	0.0	0.5	2.7	5.5	8.5	14.2	6.4	2.2	4.4	3.3	<b>4.8</b>
First aid more than three days		64.2	77.4	72.3				84.0	84.6	83.1	<b>67.6</b>
Curable Injury	78.9				78.1	67.0	79.2				<b>75.8</b>
Disablement, less than 30%	11.9	10.7	7.9	9.8	7.9	14.1	11.6	11.0	10.2	12.7	<b>10.8</b>
Disablement, 30% or more	0.6	0.7	0.3	0.5	0.3	0.4	0.3	0.3	0.2	0.3	<b>0.4</b>
Unstable injury	6.1	3.3	2.9	3.2	3.8	3.0	1.8	1.1			<b>3.1</b>
Death	1.4	1.3	1.6	1.8	1.3	1.3	0.7	0.6	0.6	0.7	<b>1.1</b>
Others	1.1	14.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<b>1.6</b>
Total	100	100	100	100	100	100	100	100	100	100	

The following measures or factors contribute to better workplace safety (OSHA, 2016; Morris and Cannady, 2019):

- All serious hazards that cause or are likely to cause death or serious physical harm must be eliminated or controlled immediately.
- Interim controls should be used while longer-term solutions are being developed and implemented.
- Choose controls in a logical order that prioritizes engineering solutions (including elimination or substitution) first, then safe work practices, administrative controls, and finally personal protective equipment.
- Choose controls that will not introduce new hazards, either directly or indirectly.
- Control options should be reviewed and discussed with workers to ensure that they are feasible and effective.

When no single control method fully protects workers, use a combination of them. Considering industrial workplaces, the hierarchy of controls includes (Nix, 2011):

1. Inherently Safe Design, including Hazard Elimination or Substitution.
2. Engineering Controls.

**Fig. 8** Hierarchy of Controls (NIOSH, 2015).

3. Information for Use
4. Administrative Controls (Training, Standard Operating Procedures, Hazardous Energy Control Procedures (HECP), Authorization/Permit to Work)
5. Personal Protective Equipment (Specification, Fitting, Training in use, Maintenance).

Because they are part of the product design process, the first three levels of the hierarchy are commonly referred to as 'engineering controls. Engineering controls have both benefits and drawbacks. They are typically preferred over other measures such as administrative and personal protective equipment controls because they are designed to eliminate the hazard before it comes into contact with the workers. Well-designed engineering controls can be costly to implement at first, but over time, this measure can significantly reduce operating costs, and in some cases, it can significantly reduce costs in other areas of the process as well (Singh and Sekhon, 2018).

## Conclusions

Jordan is confronted with economic challenges that necessitate effective measures to reduce damage and economic losses caused by workplace accidents and injuries, as it has been revealed that the work injury rate is approximately one accident every 44 minutes, with one death from a work injury occurring every three days. The average number of fatal injuries per  $10^5$  workers is 8.6. The manufacturing sector had the highest percentage of work injuries (35.9%). The most common cause of workplace injury was the "falling of persons" (29.3%). Accidents resulting in "Bruises" accounted for 33.4% of all accidents, while accidents resulting in "Wounds" accounted for 26.8%. Work-related injuries that resulted in curable injuries accounted for 75.8% of total injuries. It is recommended to raise the awareness of workers on the issues of occupational safety and health following the relevant legislation, before engaging in the labor market. Special attention must be paid to workers in the manufacturing section to maintain a low level of accidents and injuries. In addition, it is recommended to draft a national strategy concerned with occupational safety and health. All partners (ministries, employers' organizations, labor organizations, and public institutions) must be involved and represented, aiming at full coordination among partners.

## Nomenclatures

EU	=European Union	[-]
JD	=Jordanian Dinar	[-]
LOA	=Labor Organizations and Institutions	[-]
MOL	=Ministry of Labor	[-]
NIOSH	=National Institute for Occupational Safety & Health	[-]
NSD	=National Statistic Department	[-]
OHS	= Occupational health and safety	[-]
OSHA	=Occupational Safety and Health Administration	[-]
SSC	=Social Security Corporation	[-]
UK	=The United Kingdom	[-]
US	=United States	[-]

## References

- Andersen, J. H., Malmros, P., Ebbeloej, N. E., Flachs, E. M., Bengtsen, E., and J., Bonde "Systematic literature review on the effects of occupational safety and health (OSH) interventions at the workplace", *Scandinavian J. of Work, Env. and Health*, **45(2)**,103-113, (2019).
- Asanka, W. A. and Ranasinghe, M. "Study on the impact of accidents on construction projects", The 6th International Conference on Structural Engineering and Construction Management, Kandy, Sri Lanaka, 58-67, (2015).
- Department of Statistics, "Labor Statistics in Jordan (2011-2015)", Jordan (2016).
- Department of Statistics, Annual Report-Workforce Survey of 2019, Jordan (2010).
- Department of Statistics, Annual Report-Workforce Survey of 2011, Jordan (2011).
- Department of Statistics, Annual Report-Workforce Survey of 2012, Jordan (2012).
- Department of Statistics, Annual Report-Workforce Survey of 2013, Jordan (2013).
- Department of Statistics, Annual Report-Workforce Survey of 2014, Jordan (2014).
- Department of Statistics, Annual Report-Workforce Survey of 2015, Jordan (2015).
- Department of Statistics, Annual Report-Workforce Survey of 2016, Jordan (2016).
- Department of Statistics, Annual Report-Workforce Survey of 2017, Jordan (2017).
- Department of Statistics, Annual Report-Workforce Survey of 2018, Jordan (2018).
- Department of Statistics, Annual Report-Workforce Survey of 2019, Jordan (2019).
- Dodoo, J. E., and H., Al-Samarraie "Factors leading to unsafe behavior in the twenty first century workplace: a review", *Manag. Review Quarterly*, **69**, 391-414, (2019).

- Elghazally, S.A., and A. A., Ewis "A Two-Year Study On Non-fatal Work-related Injuries among Workers in Different Occupations", *Egyptian J. of Occupational Medicine*, **45**, 97-114, (2021).
- Fan, D., Zhu, C. J., Timming, A. R., Su, Y., Huang, X., and Y., Lu, "Using the past to map out the future of occupational health and safety research: where do we go from here?", *The Int. J. of Human Res. Manag.*, **31**(1), 90-127, (2020).
- Hämäläinen, P., Takala, J. and Kiat, T. B. "Global estimates of occupational accidents and work-related illnesses 2017", Ministry of Manpower Services Centre, Workplace Safety and Health Institute, Singapore (2017).
- Ivascu, L., and L. Cioca "Occupational accidents assessment by field of activity and investigation model for prevention and control", *Safety*, **5**, 1-23, (2019).
- İşsever, H., Ezirmik, E., Öztan, G., and T., İşsever "Standardization of work accidents and occupational diseases indicators of social security institution between 2008-2017 years", *J. of Istanbul Faculty of Medicine*, **83**, 434-445, (2020).
- Jordan News Agency (Petra), (2021). Hazardous Occupations in Jordan [Online]. Available: <https://petra.gov.jo/Include/InnerPage.jsp?ID=196473&lang=ar&name=news> [Accessed 14/2/2022 2022].
- Kavouras, S., Vardopoulos, I., Mitoula, R., Zorpas, A., and P., Kaldis "Occupational Health and Safety Scope Significance in Achieving Sustainability", *Sustainability*, **14**, 2424, (2022).
- Kim, D. K., and S., Park "An analysis of the effects of occupational accidents on corporate management performance", *Safety Science*, **138**, 105228, (2021).
- Labor Law. Jordanian Labor Law No. 8 of 1996 and its amendments. Jordan (1996).
- Mehmood, A., Maung, Z., Consunji, R. J., El-Menyar, A., Peralta, R., Al-Thani, H., and A. A., Hyder "Work related injuries in Qatar: a framework for prevention and control", *J. of Occupational Medicine and Toxicology*, **13**, 1-10, (2018).
- Mendeloff, J., and L., Staetsky "Occupational fatality risks in the United States and the United Kingdom", *American J. of Industrial Medicine*, **57**, 4-14, (2014).
- Ministry of Investment, (2022), Development Zones [Online]. Jordan. Available: <https://www.moin.gov.jo/en/development-zones/> [Accessed 14/2/2022 2022].
- Ministry of Labor, Annual Report 2019, Jordan (2019a).
- Ministry of Labor, Annual Report 2000, Jordan (2000).
- Ministry of Labor, Annual Report 2001, Jordan (2001).
- Ministry of Labor, Annual Report 2002, Jordan (2002).
- Ministry of Labor, Annual Report 2003, Jordan (2003).
- Ministry of Labor, Annual Report 2004, Jordan (2004).
- Ministry of Labor, Annual Report 2005, Jordan (2005).
- Ministry of Labor, Annual Report 2006, Jordan (2006).
- Ministry of Labor, Annual Report 2007, Jordan (2007).
- Ministry of Labor, Annual Report 2008, Jordan (2008).
- Ministry of Labor, Annual Report 2009, Jordan (2009).
- Ministry of Labor, Annual Report 2010, Jordan (2010).
- Ministry of Labor, Annual Report 2011, Jordan (2011).
- Ministry of Labor Annual Report 2012, Jordan (2012).
- Ministry of Labor, Annual Report 2013, Jordan (2013).
- Ministry of Labor, Annual Report 2014, Jordan (2014).
- Ministry of Labor, Annual Report 2015, Jordan (2015).
- Ministry of Labor, Annual Report 2016, Jordan (2016).
- Ministry of Labor, Annual Report 2017, Jordan (2017).
- Ministry of Labor, Annual Report 2018, Jordan (2018).
- Ministry of Labor Directorate of Policies and International Cooperation/Labor Market Data Section. Jordan (2019b).
- Morris, G. A., and R., Cannady "Proper use of the hierarchy of controls", *Professional Safety*, **64**, 37-40, (2019)
- NIOSH, (2015). Hierarchy of controls. Retrieved from [www.cdc.gov/niosh/topics/hierarchy](http://www.cdc.gov/niosh/topics/hierarchy).
- Nix, D. "Understanding the Hierarchy of Controls", *Machinery Safety*, **101**, (2011).
- OSHA, (2016), Hazard prevention and control. Retrieved from [www.osha.gov/shpguidelines/hazard-prevention.html](http://www.osha.gov/shpguidelines/hazard-prevention.html).
- Santos, A. J., Rebelo, E. L., and J. C., Mendes "Towards better prevention of fatal occupational accidents in Portugal", *Int. Labour Review*, **157**, 409-433, (2018).
- Singh, Z., and P. S., Sekhon "Need for risk management and regular occupational health safety assessment among workers of developing countries". *Global J. on Quality and Safety in Healthcare*, **1**, 19-24, (2018).
- Social Security Corporation, Annual Report 2010, Jordan (2010).
- Social Security Corporation, Annual Report 2011, Jordan (2011).
- Social Security Corporation, Annual Report 2012, Jordan (2012).
- Social Security Corporation, Annual Report 2013, Jordan (2013).
- Social Security Corporation, Annual Report 2015, Jordan (2015).
- Social Security Corporation, Annual Report 2016, Jordan (2016).
- Social Security Corporation, Annual Report 2017, Jordan (2017).
- Social Security Corporation, Annual Report 2018, Jordan (2018).
- Social Security Corporation, Annual Report 2019, Jordan (2019).
- Social Security Corporation, Hazardous Occupations, Media Centre of SSC, Jordan (2021).
- Social Security Law. Jordanian Social Security Law No. 1 of 2014 and its amendments. Jordan (2014).

- Takala, J., Härmäläinen, P., Saarela, K. L., Yun, L. Y., Manickam, K., Jin, T. W., Heng, P., Tjong, C., Kheng, L. G., and S., Lim "Global estimates of the burden of injury and illness at work in 2012", *J. of Occup. and Env. Hygiene*, **11**, 326-337, (2014).
- Ural, S., and S., Demirkol "Evaluation of occupational safety and health in surface mines", *Safety Science*, **46(6)**, 1016-1024, (2008).
- Venema, A., Geuskens, G., and S., Van Den Heuvel "New data on health and safety at work in the EU 27", *Safety Science Monitor*, **15**, 1-9, (2011).
- Wadsworth, E., and D., Walters, Safety and health at the heart of the future of work: building on 100 years of experience, ILO, Switzerland (2021).